

# *GaRGoyLe*

A map composer using  
GRASS, R, GMT & L<sup>A</sup>T<sub>E</sub>X

Francisco Alonso Sarría  
Geography Department, INUAMA (University of Murcia)

UseR!  
Albacete July 10-12, 2013

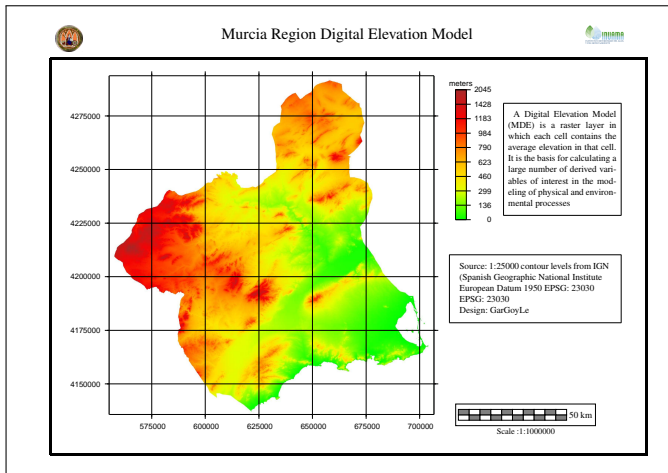


L<sup>A</sup>T<sub>E</sub>X



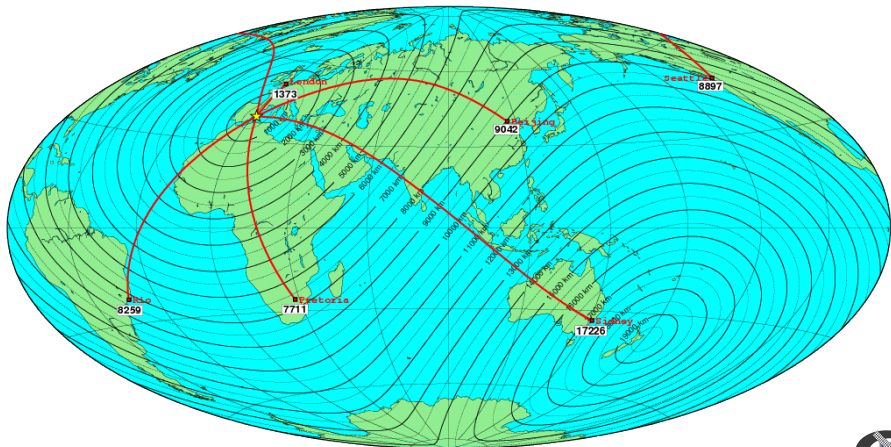
## What is GarGoyLe?

A set of R functions to create ready-to-print PDF maps from a GRASS database.



GMT

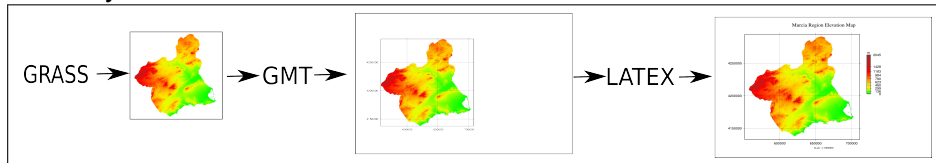
## Distances from Albacete to the World

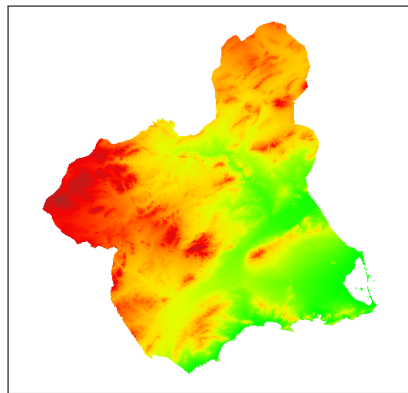
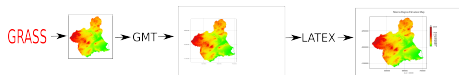


## What is GarGoyLe?

A set of R functions to create ready-to-print PDF maps from a GRASS database using GMT and  $\text{\LaTeX}$  functionalities.

## GaRGoyLe



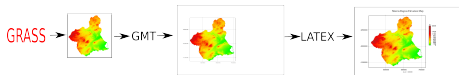


```
d.mon start=PNG  
d.rast DEM  
d.mon stop=PNG
```

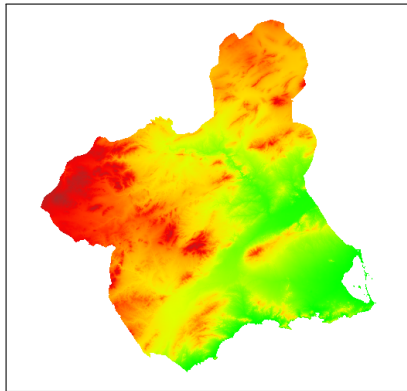




# GRASS

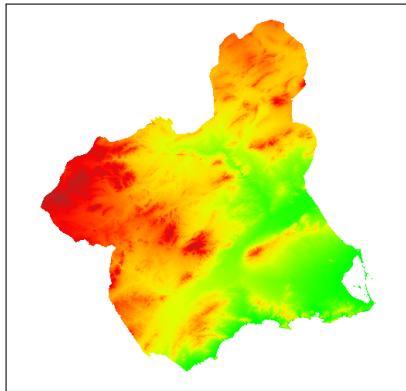


```
export GRASS_WIDTH=1240
export GRASS_HEIGHT=1240
export GRASSPNGFILE=mymap.png
d.mon start=PNG
d.rast DEM
d.mon stop=PNG
```



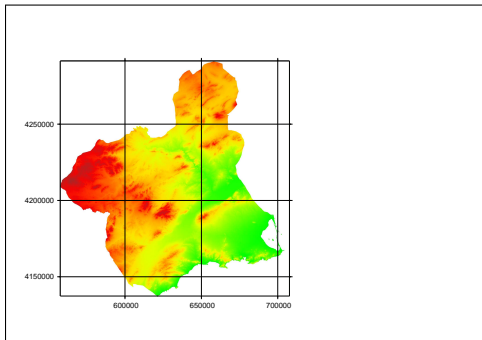
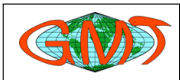


GRASS



```
export GRASS_WIDTH=1240
export GRASS_HEIGHT=1240
export GRASS_RENDER_IMMEDIATE=PS
export GRASS_PSFIL= mymap.ps
d.rast MDE
```





```
psbasemap -R552280/708460/4135300/4295780 \
-JX15c/15c -X2c -Y2c -Ba50000g50000::WeSn -O -K>mymap2.ps "
```

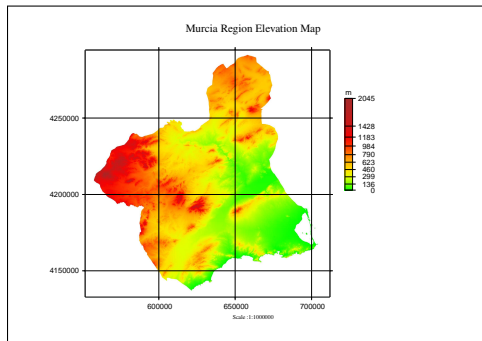
```
psimage mymap.ps -W15c -K -P -O>>mymap2.ps "
```

```
psbasemap -R552280/708460/4135300/4295780 \
-JX15c/15c -X2c -Y2c -Ba50000g50000::WeSn -O>>mymap2.ps "
```





# L<sup>A</sup>T<sub>E</sub>X



```

\documentclass[12pt,landscape,a4paper]{report}
\usepackage[absolute]{textpos}

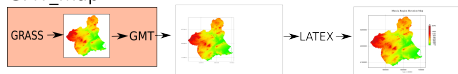
\begin{textblock}29.7(0,0)
\includegraphics{mymap2.pdf}
\end{textblock}
  
```



## GaRGoyle:

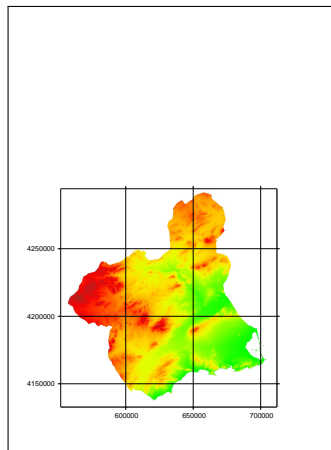
- GMT\_map
- latex\_map

### GMT\_map



```
> source("GaRGoyle")
> map=GMT_map("d.rast MDE")
```

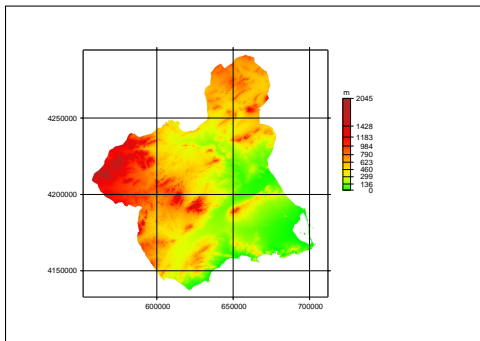
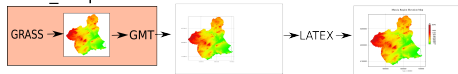
```
Width(cm)=15 Scale=1:1.06747e+06
```



## GaRGoyLe:

- `GMT_map`: A more complete call
- `latex_map`

### GMT\_map



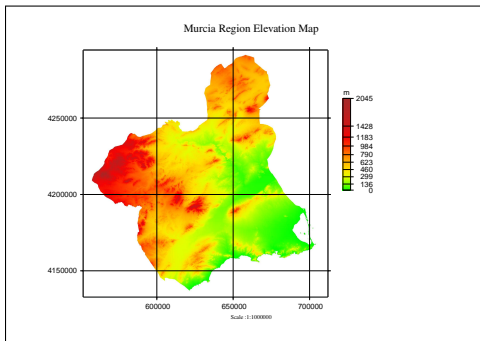
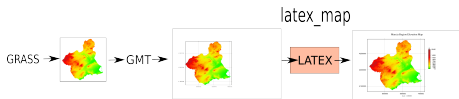
```

> GMT_map("d.rast MDEmun", scale=1000000, ori="l",
+ dxcm=4, dycm=2.5, scaleZ="MDE", scalepos=c(17,10,6,0.5),
+ output="mymap")
  
```



## GaRGoyLe:

- GMT\_map
- latex\_map

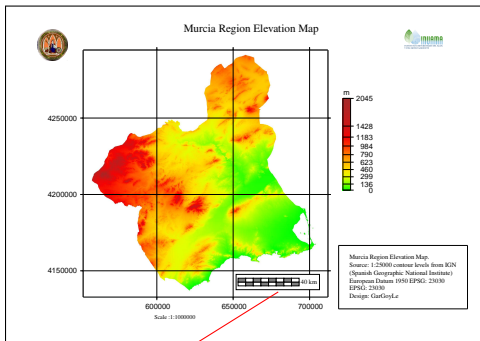
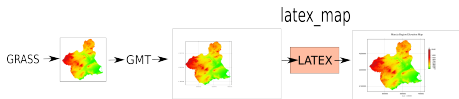


```
> latex_map("mymap", scale=1000000, ori="l",
+ title="Murcia Region Elevation Map", output="mymap2")
```



## GaRGoyLe:

- GMT\_map
- **latex\_map**: A more complete call



**L<sup>A</sup>T<sub>E</sub>X tikz package**

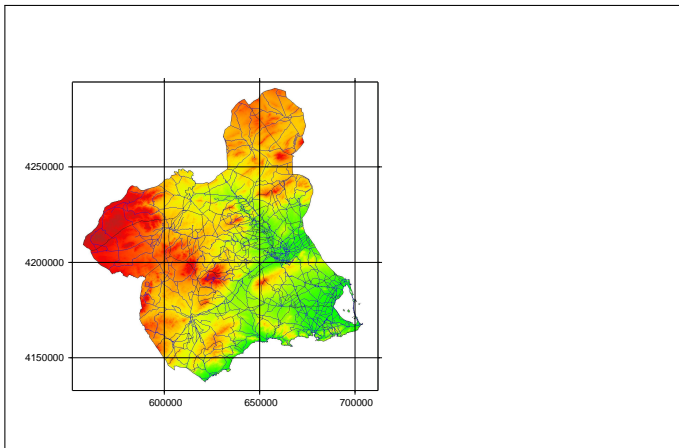
```
title="Murcia Region Elevation Map"
logos=c("logo1.png","logo2.png")
logopos=rbind(c(2,1,0.2),c(2.5,25,0.2))
latex=c("text1.tex")
latexpos=c(5,20,15)
```

```
latex_map("mymap", scale=1000000, ori="1", title=title, logo=logos,
+ logopos=logopos, latex=latex, latexpos=latexpos, scalepos=c(15,2.5,19),
+ gscaleX=14, gscaleY=17, ni=8, di=5000, output="mymap2")
```



## Other options:

### (1) Several layers

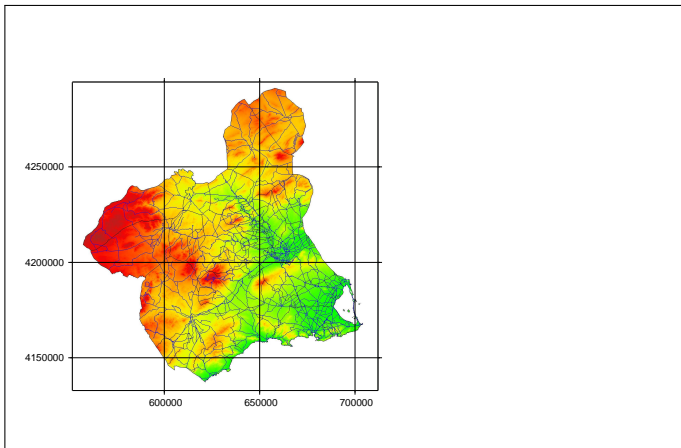
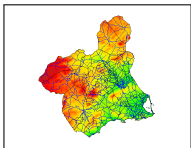


```
command="d.rast DEM;d.vect roads color=blue;d.vect munic type=boundary"  
GMT_map(command, scale=1000000, ori="1")
```



## Other options:

(2) Copy the screen

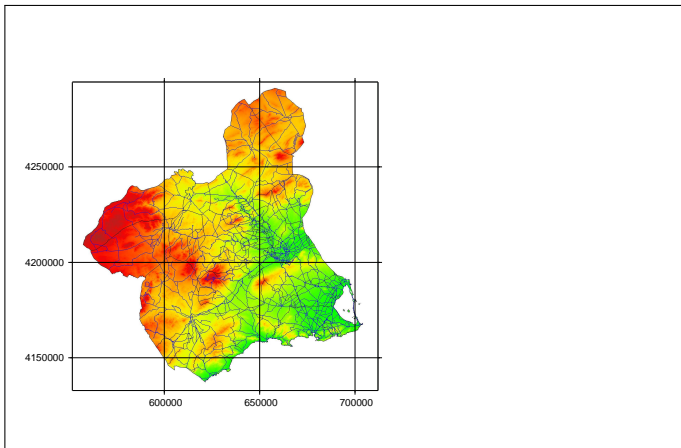


```
GMT_map("mon", scale=1000000, ori="l")
```



## Other options:

### (3) Image file



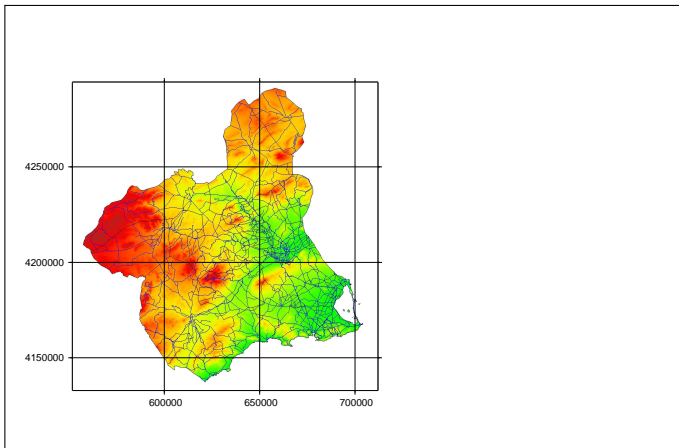
```
GMT_map("image.png", coords=c(x,y,x2,y2), scale=1000000, ori="l")
```





## Other options:

### (4) PNG driver

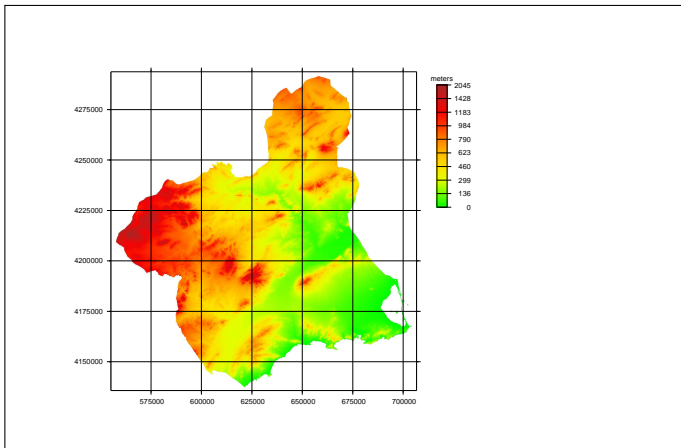


```
GMT_map("d.rast DEM", driver="PNG", scale=1000000, ori="l",  
+ output="mymap")
```



## Other options:

### (5) Custom grid

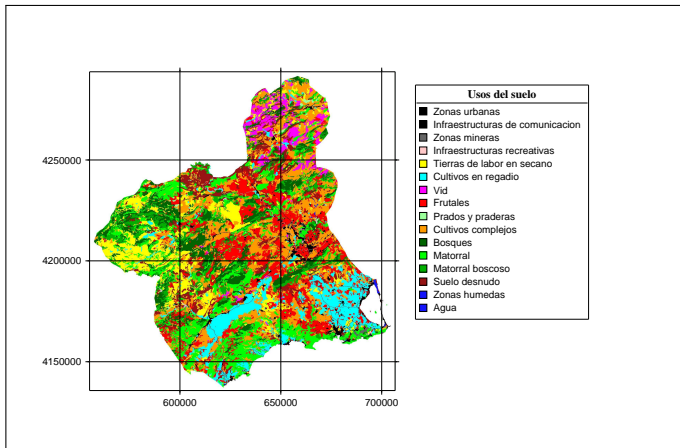


```
GMT_map("d.rast DEM", scale=1000000, ori="l", output="mymap",  
+ scaleZ="MDE", scalepos=c(17,10,6,0.5), scaleunit="m", dxcm=4,  
+ grid=10000, gmtset="ANNOT_FONT_SIZE=8")
```



## Other options:

## (6) Legends

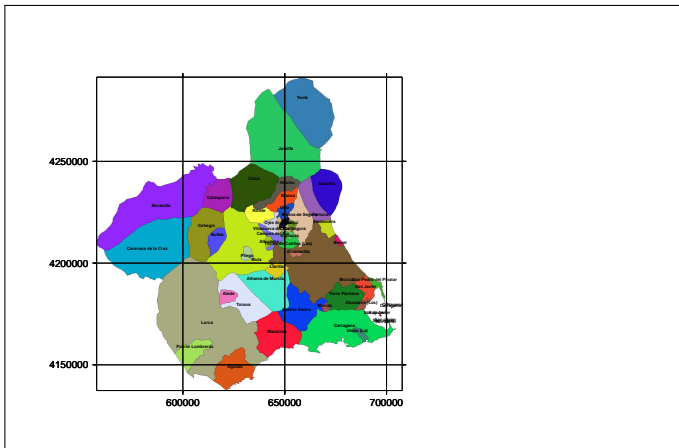


```
rast2leg("use", file="use", title="Usos del suelo", font="16 Times-Bold")
GMT_map("d.rast use", ori="l", legend="use", legendpos=c(16,15,8,11))
```



## Other options:

### (7) Label files

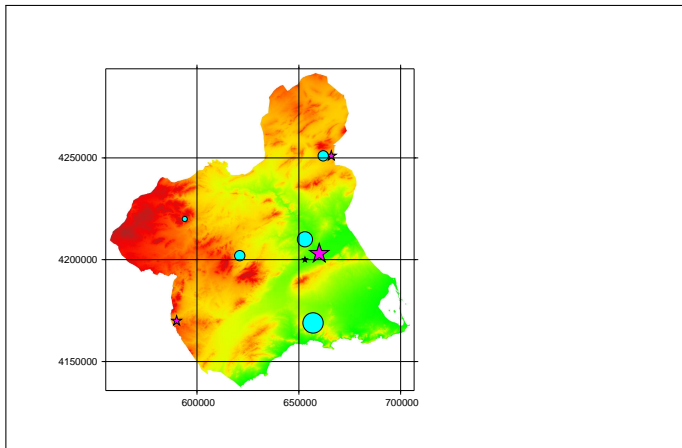


```
grasspoints2GMTtext("municip",variable="label", file="labels", size=6)
GMT_map("d.vect -c municip type=area",ori="l", textfile="labels")
```



## Other options:

(8) points dataframe



```
GMT_map("d.rast MDE", ori="l", scale=1000000, points=xy)
```

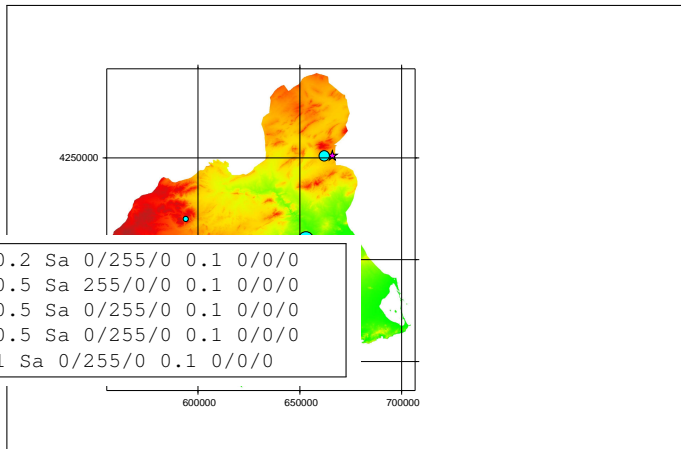


## Other options:

## (8) points dataframe

xy

653000	4200000	0.2	Sa	0/255/0	0.1	0/0/0
666000	4251000	0.5	Sa	255/0/0	0.1	0/0/0
590000	4170000	0.5	Sa	0/255/0	0.1	0/0/0
653000	4402000	0.5	Sa	0/255/0	0.1	0/0/0
660000	4203000	1	Sa	0/255/0	0.1	0/0/0



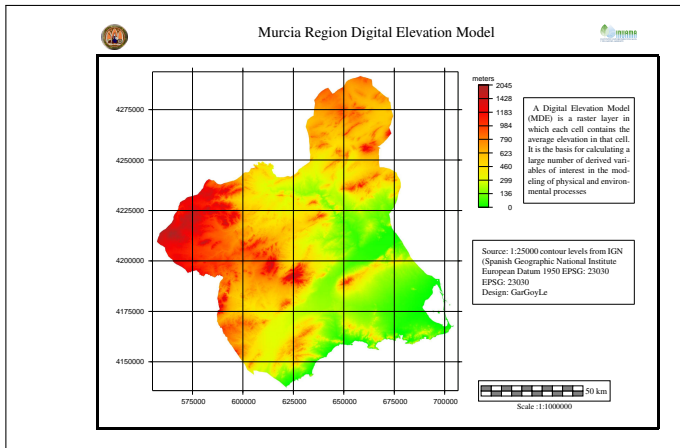
```
GMT_map("d.rast MDE", ori="l", scale=1000000, points=xy)
```





## Other options:

(10) Several latex files



```
title="Murcia Region Digital Elevation Model"
```

```
logos=c("UMU2.png", "inuama.png")
```

```
logopos=rbind(c(1.25,1.5,0.5),c(1.75,26,0.5))
```

```
latex=c("latex1.tex", "latex2.tex", "latex3.tex")
```

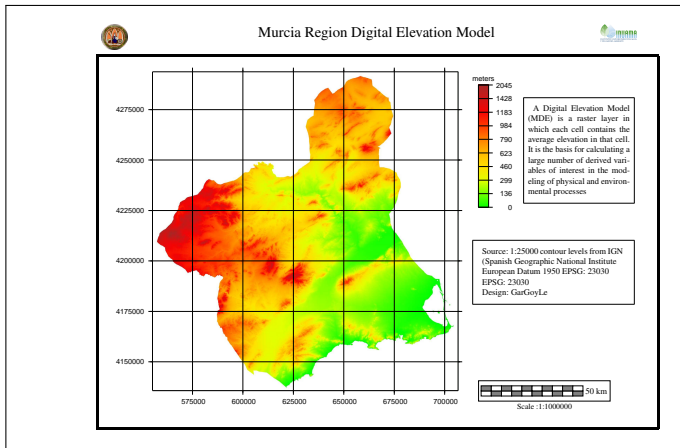
```
latexpos=rbind(c(8,19.5,11),c(6,22,4),c(26,1.25,2))
```





## Other options:

(10) Several latex files



```
latex_map("mymap", scale=1000000, ori="l", title=title,
+ logo=logos, logopos=logopos, latex=latex, latexpos=latexpos,
+ scalepos=c(15,15.75,18.5), gscaleX=20, gscaleY=18, ni=10,
+ di=5000, output="mymap2")
```



## Other functions:

- `rast2leg`, creates a GMT legend file from a GRASS raster file.
- `vect2leg`, creates a GMT legend file from a GRASS vector map.
- `vectthematic2leg`, creates a GMT legend file from a GRASS vector map (`d.vect.thematic`)

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- `create_palette` creates a GRASS color file for a raster layer using a user selected style.
- `create_palette_v`, creates a color palette from a column in the table linked to a vector layer. It can also create a GMT legend file using the palette.
- `put_palette`, creates a GRASS color file for a raster layer from values and RGB codes.
- `randomgrassrgb`, fills with random colors a column in the table linked to a GRASS vector file.



## Other functions:

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- `create_palette` creates a GRASS color file for a raster layer using a user selected style.
- `create_palette_v`, creates a color palette from a column in the table linked to a vector layer. It can also create a GMT legend file using the palette.
- `put_palette`, creates a GRASS color file for a raster layer from values and RGB codes.
- `randomgrassrgb`, fills with random colors a column in the table linked to a GRASS vector file.
  
- `grasspoints2GMTtext`, transforms labels from a GRASS vector layer into a GMT labels file.



## Requirements:

- `GMT_map` needs GMT to be installed and its modules accessible (change `PATH`).

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- The functions that produce legends use the R libraries `RColorBrewer`, `classInt`.

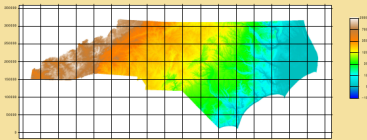


## Requirements:

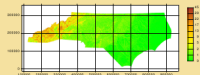
- `GMT_map` needs GMT to be installed and its modules accessible (change `PATH`).
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- To use GRASS files, the R package `spgrass6` is required and R should be open from a GRASS session.
- Most of the functions that handle GRASS vector layers assume that thematic information is stored in PostgreSQL databases
- The functions that produce legends use the R libraries `RColorBrewer`, `classInt`.
- $\text{\LaTeX}$  packages `a0poster`, `textpos` and `tikz` are required for `latex_map`.

## A Small Geomorphometric Atlas of North Carolina State Using GarGoyLe

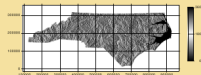
### Elevation



### Slope



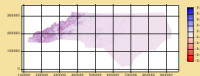
### Aspect



### Profile curvature



### Tangent curvature



GarGoyLe is a set of R functions conceived to create maps using GRASS spatial data in raster mode of data. It uses GMT to prepare the raster maps, convert and layout and cartographic secondary elements.

The examples are the North Carolina dataset available from the GRASS web page (<http://grass.itc.it/>).

Geographic Institute of Cartography and Remote Sensing



### Making off

```

#!/usr/bin/env Rscript

# A Small Geomorphometric Atlas of North Carolina State using GarGoyLe
#
# This script generates a set of maps (Elevation, Slope, Aspect, Profile
# curvature, Tangent curvature) for the North Carolina dataset using
# GarGoyLe. The output is a PDF file named 'North Carolina State
# Geomorphometric Atlas.pdf'.
#
# Usage:
#   $ ./makingoff.R
#
# Options:
#   -h: Show this help message.
#   -o: Output file name (default: 'North Carolina State
#   Geomorphometric Atlas.pdf').
#   -p: Paper size (default: 'A0').
#   -s: Scale (default: 1:100000).
#   -t: Title (default: 'A Small Geomorphometric Atlas of North
#   Carolina State using GarGoyLe').
#   -l: Logos (default: 'North Carolina, GRASS, ITA, CSIC').
#   -c: Colors (default: 'rainbow').
#   -i: Intervals (default: 10).
#   -m: Map scale (default: 1:100000).
#   -n: Number of maps (default: 5).
#   -r: Resolution (default: 500m).
#   -w: Width (default: 10000).
#   -x: X-axis labels (default: '0 10000 20000 30000 40000 50000
#   60000 70000 80000 90000 100000').
#   -y: Y-axis labels (default: '0 10000 20000 30000 40000 50000
#   60000 70000 80000 90000 100000').
#   -z: Z-axis labels (default: '0 1000 2000 3000 4000 5000 6000
#   7000 8000 9000 10000').
#
# Authors:
#   Francisco Alonso Sarria (falonso@ita.upm.es)
#   Instituto Tecnológico de Aplicaciones (ITA)
#   Consejo Superior de Investigaciones Científicas (CSIC)
#   Instituto Geográfico Nacional (IGN)
#   Instituto Geográfico de España (IGE)
#   Instituto Geográfico de Canarias (IGC)
#   Instituto Geográfico de Galicia (IGG)
#   Instituto Geográfico de Castilla-La Mancha (IGC-LM)
#   Instituto Geográfico de Cataluña (IGC-CAT)
#   Instituto Geográfico de Aragón (IGA)
#   Instituto Geográfico de Asturias (IGA)
#   Instituto Geográfico de Cantabria (IGC)
#   Instituto Geográfico de Castilla y León (IGC-CL)
#   Instituto Geográfico de Extremadura (IGE)
#   Instituto Geográfico de Valencia (IGV)
#   Instituto Geográfico de Murcia (IGM)
#   Instituto Geográfico de Baleares (IGB)
#   Instituto Geográfico de Aragón (IGA)
#   Instituto Geográfico de Asturias (IGA)
#   Instituto Geográfico de Cantabria (IGC)
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#   Instituto Geográfico de Aragón (IGA)
#   Instituto Geográfico de Asturias (IGA)
#   Instituto Geográfico de Cantabria (IGC)
#   Instituto Geográfico de Castilla y León (IGC-CL)
#   Instituto Geográfico de Extremadura (IGE)
#   Instituto Geográfico de Valencia (IGV)
#   Instituto Geográfico de Murcia (IGM)
#   Instituto Geográfico de Baleares (IGB)
#
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#
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#   License along with this program; if not, write to the Free
#   Software Foundation, Inc., 51 Franklin Street, Fifth Floor,
#   Boston, MA 02110-1330, USA.

```

```

create_palette("slo_state_500m",style="fisher",color=c("green","yellow","orange","brown"),
  intervals=10,sample=6000
)

create_palette("pcurv_state_500m",style="fisher",color=c("red","white","blue"),
  intervals=10,sample=6000
)

create_palette("tcurv_state_500m",style="fisher",color=c("red","white","blue"),
  intervals=10,sample=6000
)

GMT_map(display="d.erase white;d.rast elev_state_500m",ori="p",scale=1500000,
  paper="A0",dxc=11,dyc=78,scaleZ="elev_state_500m",output="geom1",
  scalepos=c(62,15,15,1.5),scaleoption="-L",gmtset="ANNOT_FONT_SIZE=20p",graph=F
)

GMT_map(display="d.erase white;d.rast slo_state_500m",ori="p",scale=3000000,
  grid=100000,paper="A0",dxc=5,dyc=59,scaleZ="slo_state_500m",output="geom2",
  scalepos=c(31,7,10,1),scaleoption="-L",gmtset="ANNOT_FONT_SIZE=20p",graph=F
)

GMT_map(display="d.erase white;d.rast asp_state_500m",ori="p",scale=3000000,
  grid=100000,paper="A0",dxc=45,dyc=59,scaleZ="asp_state_500m",output="geom3",
  scalepos=c(31,7,10,1),scaleoption="-L",gmtset="ANNOT_FONT_SIZE=20p",graph=F
)

GMT_map(display="d.erase white;d.rast pcurv_state_500m",ori="p",scale=3000000,
  grid=100000,paper="A0",dxc=5,dyc=41,scaleZ="pcurv_state_500m",output="geom4",
  scalepos=c(31,7,10,1),scaleoption="-L",gmtset="ANNOT_FONT_SIZE=20p",decscale=5,
  graph=F
)

GMT_map(display="d.erase white;d.rast tcurv_state_500m",ori="p",scale=3000000,
  grid=100000,paper="A0",dxc=5,dyc=22,scaleZ="tcurv_state_500m",output="geom5",
  scalepos=c(31,7,10,1),scaleoption="-L",gmtset="ANNOT_FONT_SIZE=20p",decscale=5,
  graph=F
)

title="A Small Geomorphometric Atlas of North Carolina State\\ Using GarGoyLe"
titlepos=c(84,0,1)

logos=c("North_Carolina.png","grass.png","R.png","gmt.png","Latex.png")
logopos=rbind(c(4,5,110),c(4,70,110),c(4,77,110),c(4,70,115),c(4,77,115))

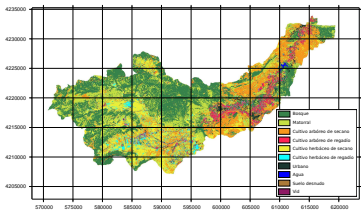
latex=c("latxelov","latxelo","latexasp","latexpcurv","latextcurv",
  "maintext","makingoff")

latexpos=rbind(c(80,11.5,13),c(80,6.5,44),c(80,46.5,44),
  c(80,6.5,62),c(80,6.5,81),c(58,5,100),c(50,40,65))

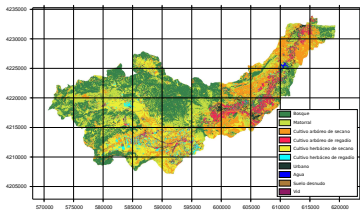
latex_map(c("geom1","geom2","geom3","geom4","geom5"),output="four_maps",
  latex=latex,latexpos=latexpos,
  logos=logos,logopos=logopos,title=title,titlepos=titlepos,ori="p",
  scale=1500000,scalepos=c(20,5,155),
  paper="A0",bgcol=c(245,225,160)
)

```

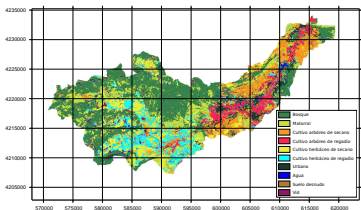




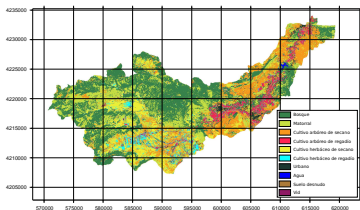
Mapa 14. Clasificación mediante Random Forest verano (Escala 1:250000)



Mapa 11. Clasificación mediante SVM verano (Escala 1:250000)

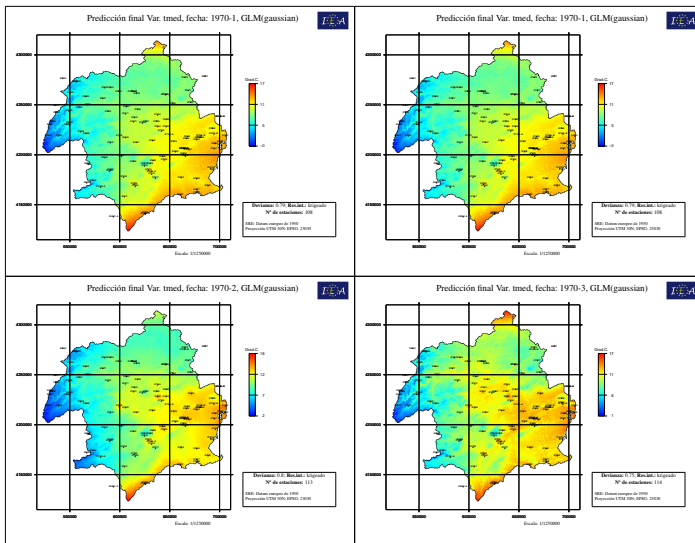


Mapa 8. Clasificación mediante SMAP verano (Escala 1:250000)



Mapa 17. Clasificación mediante Random Forest con albedo y vegetación verano (Escala 1:250000)





## TO DO

- Send the package to CRAN
- Support for `sp` package objects
- Functions that write latex code to be inserted on the map

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<http://inuama.inf.um.es/inuama/doku.php?id=gargoyle>

Thanks for your attention



## latex.tex

```
\colorbox{white}{  
\fbox{  
  \begin{minipage}{8cm}  
  \vspace{0.5cm}  
  \hspace{0.5cm}Murcia Region Elevation Map.  
  \hspace{0.5cm}Source:  IGN 1:25000 contour levels  
  \hspace{0.5cm}(Spanish Geographic National Inst.)  
  \hspace{0.5cm}European Datum 1950 EPSG: 23030  
  \hspace{0.5cm}EPSG: 23030  
  \hspace{0.5cm}Design:  GarGoyLe  
  }  
  \vspace{0.5cm}  
  \end{minipage}  
}  
}
```

